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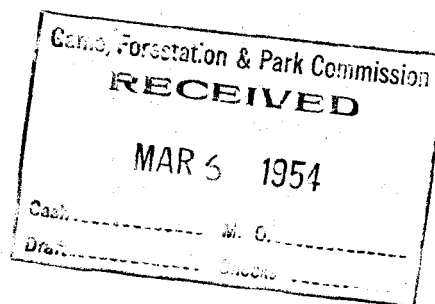
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A SURVEY OF FARM-GAME HABITAT RESTORATION PROGRAMS IN FIFTEEN STATES



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A SURVEY OF FARM-GAME HABITAT RESTORATION PROGRAMS IN FIFTEEN STATES¹

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For at least twenty years the thinking of wildlife managers has been directed toward the importance of habitat in producing surplus game populations for hunting. The decline or disappearance of game populations — often over considerable areas — following changes in habitat brought about by agricultural, urban, or industrial developments demonstrates clearly the effects of the elimination of desirable habitat. Suitable habitat is basic to the survival of wildlife. Many field observations and experiences, as well as specific data from research, validate this conclusion. Where a harvestable surplus of game cannot be maintained because of changes made by man in the habitat, the obvious answer is: *Restore the habitat*. There are many practical and fundamental challenges to this objective.

As this principle gained support, funds needed for habitat improvement were made available to the states with the enactment of the Federal Aid in Wildlife Restoration (Pittman-Robertson) Act of 1937. State Fish and Game Departments immediately began or expanded studies on the ecology and management of wildlife species, and projects designed to restore habitat soon were initiated. After a general curtailment of these programs during World War II, the states reactivated or initiated more extensive programs after 1945. By 1951 the majority had made habitat improvement a major feature of their programs.

Much of the emphasis in habitat restoration has been placed on farm-game species. There are several reasons for this—both basic and superficial. When conditions are favorable to wildlife, fertile agricultural areas are highly productive of farm game. Species in this classification have a high reproductive potential and a relatively low mobility. As expressed in the annual hunter-kill reports of most states, farm game is more readily available to a larger number of hunters than other classes of wildlife. The existence of a land-use program through soil conservation districts creates convenient administrative channels.

Although six years is a short time to show results in any program dealing with ecological changes, the present report outlines the conclusions reached in an attempt to evaluate current farm-game habitat

¹ Paper No. 2974 Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul 1, Minnesota.

development programs in fifteen states. Actually to these six years must be added the experiences accumulated from about 1933 through 1945, even though the earlier activities may have been more sporadic and piece-meal than since that time. The work was carried out between October 1, 1951 and June 30, 1952 and the following states were visited: New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Florida, Georgia, Alabama, Kentucky, Indiana, Illinois and Missouri.

METHODS

A program as important as farm-game restoration needs all the attention it can receive. It was thought that a review by a person acquainted with the fundamental concepts, but not closely bound by personal or administrative considerations, could point out the accomplishments and loopholes in the programs. This the author has attempted.

The approach to this survey was almost entirely qualitative and the evaluation was based on visits in the field to actual habitat improvements. Following a preliminary discussion with Wildlife Management Institute, U. S. Fish and Wildlife Service, and U. S. Soil Conservation Service personnel in Washington, D. C., visits to Pittman-Robertson projects in the various states were arranged. The program for each state was discussed with the project coordinator, and an itinerary, usually involving an entire week, was arranged with various field personnel. The itineraries attempted to include the following: (1) the oldest habitat restoration work in the state, (2) the areas showing most intensive development, (3) areas representative of different agricultural uses, and (4) field research projects on farm-game habitat programs. As a final step, reports on the trips were submitted to each coordinator for comment. These comments were returned to the author before preparation of the present over-all report.

Because most farm-game habitat improvement projects are scattered widely, a true random sample survey would have been very time consuming. The inadequacies of quickly surveying an extensive state program in New York, South Carolina, or even New Jersey are realized. However, significant portions of the program in most states were discussed and seen and a concept of the operations obtained in this way. Further, in general, the better plantings were seen and visited with the responsible personnel. This is not to imply a conducted tour of only the best. In most instances, accomplishments were seen as they came, and frankness was the rule rather than the exception.

I wish to acknowledge the whole-hearted cooperation of state personnel in almost every case. The most pleasant part of my experience

was the real sense of responsibility and honesty in thinking encountered in the field. The Wildlife Management Institute, through Dr. Ira N. Gabrielson and C. R. Gutermuth, encouraged the study and made it possible. The University of Minnesota readily granted a nine-month Sabbatical furlough. James Trefethen ably and generously assisted in the preparation of the reports. Several other persons, notably Walter Rosene, critically reviewed this final report.

STATE PROGRAM OPERATIONS

The objective of the state programs is the development of food and cover in areas where one or both are missing. The present trend is to stress planting of materials in small plots which can be spared from farming operations. In these cases there is a desire to use plants which should be permanent additions to the landscape and which will grow where agricultural crops do not thrive.

Although the operating systems of the fifteen states differ in many ways, each depends to some degree on the cooperation of one or several agricultural agencies. The amount of dependence appears to vary inversely with the size and age of the program. There are four general types of systems.

Ten state projects are working primarily through soil conservation districts. Usually field biologists spend considerable time with employees of the district offices instructing them in the needs of wildlife and in the use of materials supplied free of charge by the state project. Estimates of needs are obtained from these workers, and materials are delivered to the offices for further distribution to farmers. In some cases the plantings are part of a farm plan, in others the plants are used on areas where game production is uppermost in the landowner's mind. Site preparation, local distribution, planting and subsequent care are provided by the individual landowners with little supervision by trained personnel. A variation of this system is used in New York where crews employed by the soil conservation district do the actual work; the farmer is charged a standard price per unit for work performed; and the State Conservation Department reimburses the District for all costs above this price.

One state is using primarily a demonstration method. In Missouri, the project, following a widespread establishment of demonstration plots using plants or practices having both agricultural and wildlife values, attempts to develop further interest by first providing materials free to farmers, and then shifting to sale of materials to persons attracted by the first two steps (Biffle, 1951). Workers in this state report that they have completed this change with Korean lespe-

deza, farm ponds and multiflora rose. The serecia lespedeza program is well into the free-distribution stage.

Two states are doing most of the work with their personnel. In Delaware, state crews do the planning, preparing, and planting of sites on individual farms. Work is most intensive in selected areas around state-owned and developed tracts where landowners are brought into the program by direct contact. Pennsylvania workers carry on limited habitat work on certain areas designated as Farm Game Projects. A great proportion of this project's work consists of posting safety zones, operating special patrols, and distributing rye-grass seed or other materials as a service to the farmers in return for their keeping the project areas open to public hunting.

Three states are working on what might be called special areas. In New Jersey, where human population pressures and the attendant problems are most intense, the project provides materials and close supervision of development work on specific areas where access is controlled by hunting clubs, sportsmen's groups or individuals. The programs in Maryland and Indiana stress intensive development of small refuge areas on farms reached by contact through soil conservation districts or other means. In Indiana a written ten-year lease is executed for each tract and recorded with the property title.

There are many types of supplementary projects. For example, Indiana workers, in addition to the development of special areas, carry out a large multiflora rose distribution program. Most states encourage sportsmen's groups to improve selected areas, and sometimes the development of public hunting grounds is linked closely with the general farm-game program.

SPECIFIC PRACTICES

Each state program utilizes one or more specific practices of habitat improvement. Simplicity in (1) administration, (2) technique used and (3) means of applying the technique on the land appears to be a primary objective in most cases. With this simplicity, large programs, as to numbers of plants distributed and areas treated, can be inaugurated quickly and results reported in short order. There follows a listing of practices observed with an indication of the magnitude of these programs and their regional locations. The problems encountered in this survey are discussed.

Shrub and tree planting.—The planting of nursery stock is the backbone of most programs. In general, such stock can be produced quickly, units can be tallied and reported individually, distribution is relatively simple and a concrete entity is delivered to the farmer. The latter point has definite psychological advantages. Many project

workers also cited that the distribution of shrubs called attention to their importance as a desirable type of vegetation in contrast to grass, cultivated plants, or trees which always have received much publicity.

Shrub *Lespedeza* (*Lespedeza bicolor*) is the most important species in use on farm-game projects in terms of numbers of plants distributed. In the states visited, about 27 million seedlings and 40,000 pounds of seed were distributed during the 1951 planting season (Warvel, 1951). Six southern states—South Carolina, Georgia, North Carolina, Alabama, Virginia and Kentucky—each had distributed between one million and eight million plants. Delaware, Maryland, Florida, Missouri, and Illinois had used these plants in smaller numbers. However, it seemed apparent that numbers of plants alone provide a poor criterion of the real value of this practice.

The distribution of shrub *lespedeza* plants and seed in large quantities is primarily through the local soil conservation district offices, although in some cases game wardens and county extension agents play important roles. Usually a game department truck, manned by field biologists, delivers a county quota to the office in question, and farmers or landowners come to this office to obtain the materials. The individual is expected to plant them in sites selected previously as part of a farm plan or game program. The sites are assumed to have been prepared in advance.

The reasons for this popularity are several. The seeds of shrub *lespedeza* are eaten readily by quail. They drop to the ground throughout the winter months and are said to be available during this entire period. The plant is considered to be a relatively permanent addition to the landscape due to its own longevity (Davison, 1949). Most field workers think of it as capable of withholding the invasion of trees and other woody plants. Seedlings are produced in one year and can be handled efficiently in large shipments.

There appear to be several serious limitations to the ultimate value of present extensive shrub *lespedeza* programs which will be discussed briefly as immediate and long-term problems.

First to be considered is the actual survival of the plantings. Three states have conducted checks on first-summer survival. In North Carolina a 10 per cent check determined that 61 per cent of the plantings had a plant survival of 70 per cent or better. South Carolina personnel checked 14 per cent of the 1950 plantings and found that 69 per cent of the plantings survived 60 per cent or better. In Virginia, interviews with 10 per cent of the farmers planting shrub *lespedeza* in 1950 revealed that three-fourths reported a survival of 75 per cent or better (Little, 1951).

The causes of failures listed in these studies were: Materials not

delivered (3 per cent in North Carolina), materials not planted (13 per cent in North Carolina, 25 per cent in South Carolina, and 9 per cent in Virginia), poor survival (23 per cent in North Carolina, 5 per cent in South Carolina, and 25 per cent in Virginia) and poor planting pattern (1 per cent in South Carolina).

Two states have made surveys which checked survival for several years. Kentucky biologists checked 869 plantings and considered 38 per cent successful, 42 per cent unsuccessful (due to being too small in size) and 20 per cent failures. Over a four-year period 69 per cent of the plantings in Florida have been checked and reported as 8 per cent excellent, 12 per cent good, 37 per cent fair, and 43 per cent poor. Kentucky's standards are very high, and the 42 per cent classed as unsuccessful due to small size would have been judged successful in other states. Florida, as a result of its studies, is shifting to other plants.

There is a more important question which must be considered; i.e. whether or not the plantings are located where they are of value to game. This has two aspects: (1) Where several elements in the habitat are missing, the shortage of winter food may not be the limiting factor. Shrub lespedeza planted between large fields and dense woods or in small plots in grazed areas may not be of value if there is a widespread deficiency in nesting or roosting cover; or (2) plants may be placed in areas where there already is an adequate winter food supply. For example, during the survey, many stands of shrub lespedeza were seen in areas where Korean lespedeza was growing profusely. Inasmuch as both plants are reportedly winter foods for quail, the efficiency of special plantings of shrub lespedeza under such conditions seems doubtful. In the author's opinion these are serious questions that merit quantitative answers. In some areas—notably the tobacco region of south-central Virginia—where there is a wide variety of intermixed cover types, quail sign was common in the shrub lespedeza plantings. In many areas it was not.

Choosing locations where best growths can be expected seems as important as proper location for quail use. Shrub lespedeza has been expected to grow on soil not useful to agriculture and the large distribution programs tend to place it on spots which are not in crops for a variety of reasons, chiefly low fertility. To be sure, fertilization is recommended for good growth of the shrub. However, the report of the Virginia survey states that only 60 per cent of the farmers applied fertilizer at the time of planting. Two statements were obtained on the fertility requirements of the plant. One worker in Alabama said he believed that the soil fertility must be equal to that required for corn, and another, in Missouri, said that good alfalfa

soil was necessary. Many cases of shrub lespedeza making very poor growth due to low site quality were observed.

Based on impressions gathered during the field work, it is estimated that deficiencies in planting, low survival, and poor location of plantings reduce the initial significance of the plantings by 50 per cent.

Field observations and discussions during the present survey show that there are various limitations on the long-time values of shrub lespedeza. The plantings have been regarded as permanent additions to an area, but this assumption is not always valid.

The plant in question is a shrub. In the Southeast, plant succession toward forest types is a vigorous process. Pines, red gum, sassafras, and Japanese honeysuckle are particularly rapid invaders of brushy areas. Except for plantings on the Pokemoke State Forest in the eastern shore of Maryland, this survey failed to find border plantings ten years old or over that were not giving ground rapidly to woody plant invasion. Many plantings, five to ten years old, were found to be succumbing. Especially striking examples of invasion by honeysuckle were seen in the Piedmont areas of Maryland, Virginia, North Carolina, South Carolina, and Alabama. Cases of rapid invasion by pines, red gum and sassafras also were seen. Certainly, here is a real problem.

Another factor is the quantity of seed production by shrub lespedeza plants even though no plant invasions take place. Here again no data are available, although a Missouri worker states: "The plants fall off in their seed production just as soon as the available nutrients fall below the minimum necessary . . . this may occur in the tenth, seventh, fifth or as low as the third year. . . ." It appeared that many plantings seen in all states were losing seed production by their fifth year. When it is remembered that significant seed production often does not start until the second or third year, the useful life of such plantings is indeed short.

The various types of deterioration can be overcome, for a time at least, by maintenance practices such as cutting, chopping, disking or burning and then fertilizing the stands at intervals, (Rosene, 1952). The most striking demonstration of the values of such work was seen near Providence Forge, Virginia, where bulldozing part of a five-year-old stand for landscaping purposes resulted in the elimination of invading woody plants and vigorous sprouting of the shrub lespedeza. The necessity for maintenance is recognized and these practices are being carried out on certain state-owned tracts and shooting preserves. However, maintenance work is not being carried out as a part of the extensive programs on farm lands in most states. In many cases field

technicians were not aware of the importance of this problem in their areas.

Still another facet of the long-time problem that appears important is the life of the planting in the face of farming practices. All too often, particularly in tenant farming areas, established shrub lespedeza borders had been destroyed by the plow or by grazing. In many areas the farm hand has been trained, over a long period of years, to "brush out the field borders." To these men shrub lespedeza was so much brush and, even though instructed otherwise, they forgot to follow orders.

When one considers these longevity problems, it appears that the present programs must be devaluated at least another 25 per cent. This leaves, at best, a 25 per cent positive result for, perhaps, five to ten years.

Growth habits of individual shrub lespedeza plants on the coastal plain and Piedmont regions of the southeastern states were strikingly different from those observed in Kentucky, southern Illinois, and Missouri. East of the Appalachians growth was heavy, with annual resprouting from the main stems at varying heights. To the west, growth was lighter and regrowth each year was almost exclusively by basal sprouts. East of these mountains seedlings were found in only one case, while in the west seedling production was observed in nearly every stand of shrub lespedeza more than two years of age. On the basis of this survey, no significance can be attached to this difference, except that early developing grasses seemed to be affording serious competition to the basal sprouts in the western plantings. The difference does demonstrate that the transfer of a practice from one region to another may bring about different plant reactions.

Multiflora Rose (*Rosa multiflora*) was second in importance in terms of numbers used during 1950-51. About 13 and one-half million seedlings had been distributed in the states visited. Workers in Indiana, Missouri, Illinois, and New York distributed two and one-half million to four million plants. Other state projects using this plant are Kentucky, North Carolina, Maryland, New Jersey, Pennsylvania, Delaware, and Florida. The Virginia Commission has an announced policy of not using the plant. Multiflora rose is not used in South Carolina, Georgia, and Alabama.

Multiflora rose seedlings are being sold at about cost by all of the leading states. Frequently distribution is direct to the farmer by express or mail instead of through soil conservation district or other offices. Mass production and distribution techniques have been well developed. Here is another broadcast distribution system but with the advantage of a direct farmer economic interest.

The reported values of multiflora rose are primarily agricultural although Wandell (1948) cites notes on its use by pheasants, cottontail rabbits, and songbirds, while Edminster and May (1951) state, "It is a first-rate wildlife cover plant" and "The fruits . . . provide good food for pheasants and many other birds."

There are few data on survival of multiflora rose plantings. Missouri Field Service Agents inspected 879 plantings of the 1950 season and reported 67 per cent survival. A similar inspection of 1951 plantings indicated that 76 per cent of 90 plantings survived. In 1951 Commission biologists inspected 478 all-age demonstration plantings (planted by Commission personnel on private lands) and rated 73 per cent as good to excellent, 15 per cent as requiring at least six years to become stockproof and 12 per cent as never becoming stockproof. It is interesting to note that the range of survival is similar to that shown by the surveys of large shrub lespedeza programs.

Longevity of plantings appears to be no problem. The 22-year-old multiflora rose plants at the Greys Summit Arboretum in central Missouri are about 9 feet high and spread over an area 15 feet in diameter. About a dozen ten-year-old plantings seen in Missouri were growing to similar proportions. A hedge established in 1938 in eastern Maryland had grown profusely until its height averaged eight or nine feet and the width 12 to 14 feet. On the other hand, a four-year-old hedge in Montgomery County, Maryland is being eliminated by Japanese honeysuckle. This latter plant may be a problem with rose as well as with shrub lespedeza.

There are two opposing aspects to the problem of survival and longevity of rose. First, do the plants survive and grow well enough to justify their use, and second, do the plants grow so profusely as to become a pest? These aspects appear to have distinct regional connotations.

In the northern and midwestern states it appears that survival is the problem. Quality of site preparation is all-important here as seedlings are vulnerable to weed and grass competition and require high fertility for rapid growth. All states distribute planting instructions emphasizing site preparation by plowing, disking and fertilizing. Care for the first two years by use of mulches, protection from grazing and replanting "skips" also is stressed. Nevertheless, frequent cases of poor hedge development were seen. This appeared more evident in the states which had inaugurated rose distribution most recently.

In the seaboard states, particularly the more southern ones, the question of this rose becoming an important agricultural pest occurs. Rosene (1950) points out the need for caution. Old plantings of

multiflora rose, seen in Maryland (eastern shore), eastern Virginia and Georgia, as well as the Cherokee rose (*Rosa laevigata*) in Alabama, are living demonstrations that caution is of extreme importance. The vigorous growth of young plantings and the occurrence of branch runners in North Carolina plantings add to this impression.

Although implications have been made that the thorny, upright variety of multiflora rose plants is being distributed and that these plants have remained in place for dozens of years without spreading (Edminster and May, 1951), all older plantings seen in the eastern seaboard area during this survey demonstrated otherwise. In fact, rose has spread very considerably at the site pictured in the publication mentioned. Actually, the validity of the variety may be open to question as, under the pressures of the rapidly expanding program, nursery men have taken seed wherever and whenever convenient. Since this plant is cross-pollinated, considerable variation in seedlings can be expected under these conditions. Variations in flower character and growth frequently were seen.

Basic ecological differences as expressed in differing plant climaxes may be of vital importance in this problem. In Kentucky, Illinois, Missouri and Indiana, where *conditions leading towards a prairie climax exist*, rose growth appears less luxuriant and spreading seems less active. In the seaboard states, extremely rapid growth, climbing, shoot runners and active spreading by seed were seen. These *areas are those of a forest climax*. Perhaps the plant responds differently to the environment in prairie and forest areas. Field workers in Indiana and Missouri stated that spreading was more common in the southern forested sections of those states. It appears clear that transfer of midwestern data to the east coast is risky in this case.

More fundamental to the problem of multiflora rose is: What are the wildlife values of the plant as used in these distribution programs? Granted, it looks better to the wildlife manager than a barbed-wire fence. How much better is it, under what conditions, and to what wildlife? Heavy use of young plantings by cottontails was seen in Missouri and North Carolina, but, this may have been a reflection of the fertilizer added at the time of planting. During May, pairs of bobwhite were seen in the vicinity of hedges in Missouri and Illinois, but, ample herbaceous cover was available at this time. Pheasants have been reported as surviving on the fruits of rose under pen conditions (Johnson, 1951). During the survey, only one instance of direct evidence of pheasants using the fruits in the wild was reported and this under what was judged to be starvation conditions. Data on these questions are lacking in a year when 13 million rose seedlings were distributed as a wildlife management measure.

The concept in Missouri is that rose hedges would serve as "tie-in" cover or travel lanes between stream bottom and woodlot cover of the northern Ozark Plateau. It was learned that wildlife use of isolated fences or patches is scant. In pasture areas of other states rose hedges of a half-mile or more in length were seen extending between pastures and/or cultivated fields. How much of these hedges will be used by wildlife?

The duration of the cover values to wildlife is unknown. The ground underneath a well-established hedge becomes bare. There are no data to show whether the changes in a maturing rose hedge affect use by wildlife species. In some areas the drooping branches are being mowed at heights of a foot and over to combat spreading. Hedges treated in this manner were judged to be of low wildlife value.

Conifers rank next in importance in habitat restoration programs primarily because of the more than nine million trees planted in New York. Illinois and Pennsylvania have each planted about a million trees. Other states using conifers are Indiana, Maryland, New Jersey and Delaware. When added to the above, the total planted in the states visited was about 12 million trees.

Coniferous growths usually are planned to add winter cover in areas of extensive deciduous growths or open fields in the more northern states.

The New York program appears outstanding for several reasons. First, the conifers used were those for which the foresters already had well-developed nursery and planting techniques. Second, the program fits into the economics of land abandonment in the southern parts of the state. Third, the farmer pays for the planting of trees by planting crews thus insuring uniform planting. Fourth, cutting for Christmas trees and lumbering, by keeping the stands broken up, may well prolong the usefulness of the planted areas for wildlife. A final and most important reason is that the program appears to fit ecologically.

With regard to the ecological aspects, in practically every one of some 90 examples seen, the relatively small plantings (upper limit 10,000 trees) were islands of coniferous cover in an expanse of brushlands, hardwoods and/or agricultural land. There is ample research evidence of the use of such areas by ruffed grouse, snowshoe hare, cottontail and deer.

The major danger with the use of conifers appears to be the possibility of overplanting areas with the result that subsequent maturity of the stands practically eliminates ground cover. Where utilization of the trees at an early age for Christmas decorations, mine timbers, or pulpwood can be developed this danger subsides. The difficulty appears acute particularly where small brushy areas in primarily agri-

cultural regions are planted solidly to conifers. One such area in northern Indiana had reportedly not been used by pheasants the previous winter although the adjacent weakly growing weeds of a fence row were utilized.

Shrubs are being distributed by several states. The most common plants in use are silky dogwood (*Cornus amomum*), Tatarian honeysuckle (*Lonicera tatarica*), hybrid hazelnuts (*Corylus* spp.) and high-bush cranberry (*Viburnum trilobum*). Pennsylvania and New York distributed most of the one million plants reported used in 1951. Other states using these plants are New Jersey, Illinois and Maryland.

These shrubs are described as sources of wildlife cover and fall foods (Edminster and May, 1951.) No field data are available on survival or use by wildlife of these plantings as used in the states.

There seemed to be several serious ecological questions involved in the use of such shrubs. Not infrequently, native brush species are cleared off or at least ignored in planting these shrubs. In one state silky dogwood often was planted in or adjacent to native stands of the similar red osier dogwood (*Cornus stolonifera*). In other locations plants such as blackberries (*Rubus* spp.), hawthorn (*Craetegus* spp.) and similar native fruit-bearing plants were growing vigorously on or adjacent to the planting site. It seemed apparent, also, that these artificially established plants lost their fruit about as quickly as the native shrubs. The ability of these shrubs to withstand forces of plant succession toward forest growth is unknown. In short, the value of these plantings was not apparent to the author.

Seeding.—In addition to seeds of shrub lespedeza, two other plants are being distributed extensively by seed for use in field borders. These are both herbaceous and hence are not subjects of nursery practices. Distribution of seed is even more simple than that of seedlings and the preparation of site and planting is similar to normal agricultural operations on the farm. Balanced against these two advantages are the ones of less sure establishment and even more vulnerability to plant succession.

Serecia lespedeza (*Lespedeza cuneata*) is used in Missouri, Virginia, North Carolina, South Carolina, Delaware, Kentucky and Pennsylvania. It is thought of as a plant providing low dense nesting or roosting cover for bobwhite quail and cottontail. Missouri's active program (158,000 pounds of the 200,000 pounds distributed in 1951) envisions its use in the control of erosion in small gullies. Other states are using the plant most frequently in conjunction with shrub lespedeza plantings. Evidence of use by cottontails was common in Pennsylvania and Missouri. It appears that the plant frequently adds a type of cover all too infrequent in agricultural areas and that it has

value from this standpoint. It also is obvious that in areas of rapid plant invasion by conifers or other trees maintenance would be necessary.

Partridge pea (*Chaemaecrista fasciculata*) was used in the Alabama and Florida projects where nearly four tons of seed were distributed in 1951. Stands seen in those two states were heavy and appeared to be producing large quantities of seed said to be of value to bobwhite. The maintenance of plantings by disking or burning is practiced on state-owned tracts, but how well it is carried out on private land is unknown.

Several practices designed to establish plants of value to wildlife throughout fields rather than along borders were observed with interest.

Korean lespedeza (*Lespedeza stipulacea*) was outstanding in this respect throughout the Piedmont Region of states from Delaware south and in southern Indiana, Illinois, Missouri and Kentucky. Delaware planted 333 acres of this seed during the 1950-51 season. In Missouri, Korschgen (1952) reports this plant is used widely both for hay and pasture and is the most important (winter) quail food. In these areas Korean lespedeza may well be of prime importance to quail.

Ryegrass seed is distributed by the Pennsylvania project to farmers for use as a fall and winter cover crop in cornfields. Fields seen had additional green cover that was being used by rabbits.

Florida beggarweed (*Meibomia purpurea*) stands in cornfields on private game areas near Thomasville, Georgia, were demonstrated by Komarek. These developed as a result of increasing fertility with heavy potash applications.

At the Coastal Plains Wildlife Experiment Station in Georgia, work is beginning on developing tillage practices favorable to wildlife and yet acceptable to the farmers of the area.

Controlling plant succession.—Several techniques affecting plant succession, other than planting, were being carried out in various states. A practice designed to increase production of food and cover for wildlife is the fencing of areas against livestock. In New York, some 10,000 acres of woodlots were reported fenced as a result of the habitat improvement program in 1951. Here the project provides part of the materials free, and the farmer is expected to complete the fencing. Indiana and Maryland also assist in the fencing of wildlife areas, although on a smaller scale.

Since the response of vegetation to protection from grazing is relatively slow, no real points can be stated at present. On several ten-year-old areas in southern Indiana, the plant succession toward trees

had apparently gone so far as to reduce ground cover and food-bearing plants drastically. It would seem that such programs should allow for occasional cutting or grazing to maintain what might be desirable wildlife conditions.

The practices cited above involved advancing plant succession as described by Leopold (1933). Examples of retarding succession so as to maintain desirable wildlife habitat conditions were observed with interest.

The small-marsh program in New York is outstanding. Here, by flooding shallow areas to create dense emergent vegetation, desirable waterfowl, muskrat and winter pheasant cover is being produced in areas where it was almost non-existent. Missouri farm-pond programs have somewhat similar objectives. Some forward-looking policies as to maintenance also will be necessary here.

In Pennsylvania, 65,000 linear feet of woodland borders have been cut by project personnel at an expense of 25 cents a foot or \$360.00 an acre. The borders inspected have a profuse growth of weeds and heavy sprouting of the hardwood stumps. Although they appear to be excellent cottontail habitat and pheasant winter cover, no data on the use by wildlife is available. Here the problem of maintenance in the face of sprouts and forest invasion looms large.

New Jersey workers are experimenting with the use of the axe and the saw in retarding growth of hedgerows. Studies of cottontail populations are being carried on simultaneously.

In several southern states, fire is being used on large state-owned tracts to manipulate cover and food. Certain plantations visited in southern Georgia and Florida are also engaged in this practice. Those near Thomasville, Georgia, under the supervision of H. L. Stoddard are outstanding.

Special areas.—The Indiana and Maryland departments both conduct extensive programs of developing special areas on private farms. Examples visited often constituted islands of cover and food in otherwise intensively farmed regions. A major part of the technique is fencing from grazing; but food (shrub lespedeza, woody shrubs, and Korean lespedeza) and cover (conifers, serotia lespedeza and multiflora rose) also are planted. In each state many areas appear to be overplanted, either with more food than the wildlife (which can use the area) might be expected to consume or with conifers which will soon shade out ground cover. Methods of maintaining desirable combinations of herbs, shrubs and trees by grazing, burning or cutting need to be worked out.

The longevity of these areas as units is of special interest, as many of the other practices mentioned above seem transitory. In 1948 In-

diana workers reported on an excellent study of 877 prewar leased areas. This analysis shows unsatisfactory conditions on 45 acres (later discontinued) while habitat conditions are rated as good to excellent in 679 areas and poor to fair on 170 areas. Landowner enthusiasm is listed as "indifferent" in 97 cases and "interested" in 680 cases. In summary, about 25 per cent were listed as "poor" or "abandoned" and 10 per cent of the owners were indifferent. The striking part of the survey in this state is that the older areas still are in existence and furnishing some food and cover in intensively farmed country.

Cost estimates can be made for this project. Computing from the 1950-51 budget of \$63,000, which was spent on 317 areas totaling 4,249 acres, the unit costs are about \$200.00 per area or \$12.50 per acre. Based on areas seen, a ten-year survival of areas may be expected. No data on movement of game from these areas are available; so that their significance cannot be evaluated from the standpoint of game production.

INVESTIGATIONS

The types of investigations carried on in relation to the programs seemed to be dual—administrative checks and research. This is not to imply twice too many. In fact, stock-taking and research seemed to be woefully short of what, in the face of the lack of knowledge, is adequate.

Administrative checks.—Data on the efficiency and significance of the projects were found in some instances. The results of these have been cited in the discussion of actual practices. In Florida, South Carolina, North Carolina, Delaware and Kentucky, annual organized sample checks have been conducted on first summer survival of plantings. In Virginia and Missouri, the survival of materials distributed in one summer have been surveyed. Indiana workers made a detailed survey of the fate of special areas after a two- to seven-year period. As the present survey was carried on, Maryland workers interviewed many landowners concerning areas developed on their property, and in New York studies were being instituted through Cornell University. New Jersey workers, through close work with specific areas, are well aware of their progress.

These checks are all of great value. They are primarily directed toward the fate of plantings—existence or disappearance—with little or no estimate of their significance ecologically.

The problems of longevity—not only the plantings but also of their productivity—have not been surveyed in any state except the Indiana special areas. In view of the frequent use of shrubs in areas subject

to rapid invasion by forests, this problem seems of paramount importance.

Research projects.—Studies that might be termed research into basic features of the program are few. Greenwell (1952) has reported on "Farm ponds, their utilization by wildlife" in Missouri. In New York a project designed to explore the plant succession in small-marsh projects is well established. A Pennsylvania research program is studying cottontail habitat manipulation in certain areas. Workers in South Carolina, Georgia, and Kentucky are initiating field studies on state-owned areas to test results. The Florida department has two excellent active studies. In several states—Alabama, Virginia, and Missouri—minor projects on portions of the program are carried on by the Cooperative Wildlife Research Units.

Studies being carried on as the projects develop should be especially mentioned. In Delaware the relationship of corn production to field borders has been analyzed quantitatively and significant data applied to the program itself (Caulk, 1951). In Virginia a field biologist is censusing farms with shrub lespedeza borders to test quail reaction to them. In New Jersey cottontail use of managed hedgerows is watched closely and in Florida research on quail populations in areas developed with shrub lespedeza is being carried on. These are striking demonstrations of workers developing field knowledge of their project as they progress.

The activities of the Research Division of the U. S. Fish and Wildlife Service should be mentioned here. At Patuxent, Maryland, wildlife on a developed farm is being contrasted with wildlife on an undeveloped farm. Mr. Walter Rosene is carrying on field work in Alabama and South Carolina on the relation of quail populations to development of shooting-preserve areas with shrub lespedeza.

Edminister and May (1951) have surveyed the survival and food production of shrubs in carefully selected areas of the Northeast.

These projects, many of them very worthy, are undermanned, underfinanced and underequipped compared to the development projects. When it is realized that there are almost *no data* to show that habitat improvement practices, as now carried on, have increased the security threshold of areas for farm game, their scope and size is most inadequate.

DISCUSSION

When analyzing and evaluating wildlife management programs of this type, five questions should be taken up as follows:

1. Are the programs sound as regards basic plant ecology?
2. Are the programs sound as regards wildlife ecology?

3. What is the permanence of the practice?
4. What are the real costs in terms of game produced over a period of years?
5. Are these questions understood and analyzed objectively by the agencies carrying out the programs?

These points seem basic to a lasting program of habitat management. They should be paramount to public relations, ease of administration, political considerations and the beauties of landscaped farms. Where the latter points are used to justify programs, technicians and administrators alike have learned to regret unwise decisions. The present survey uncovered little actual data on these five points but can serve to point out certain major problems in connection with each.

Plant ecology.—These problems are as follows: Forces of plant succession are rapidly working against shrub and herbaceous plantings in many cases. This is particularly true of the shrub lespedeza in the Southeast. Similarly, the maturity of planted conifer stands may mitigate against ground cover on other developed wildlife areas.

The growth of both shrub lespedeza and multiflora rose appears different east and west of the Appalachian mountains. Wildlife managers must avoid the pitfalls of expecting one plant to react the same in different environments.

The concept that wildlife plants can be grown effectively in places unsuited for agriculture also deserves close scrutiny. It is apparent that in many cases poor land is expected to do wonders in producing food and that we are ignoring the fundamental importance of soil fertility in this respect.

Wildlife ecology.—Problems of significance to wildlife itself are equally important. Small stands of a desirable plant scattered here and there may not replace the larger losses of a changing land-use pattern that eliminates the intermixture of various cover types found under more primitive farming. In many cases the values of small plots appear most doubtful.

Does the opposite approach—that of developing food or cover plants in the fields—offer more possibilities? The ryegrass program of Pennsylvania and presence of Korean lespedeza in many states represent attempts in this direction. The work of Komarek, on private lands, to develop growths of Florida beggarweed, is another approach. Such techniques attempt to affect whole fields rather than isolated spots on each farm.

Closely related to this problem is the one created by extensive programs using one technique in wide areas. How often does the practice merely add food or cover to an already existing abundance of one or the other? In one area, every shrub lespedeza border seen was ap-

proached through quantities of Korean lespedeza—an excellent winter food for quail. In another area, blackberry and thornapple plants were being torn out and replaced with multiflora rose.

Permanence.—Three major points related to the permanence of the practices are: (1) plant succession, (2) continuance of food production or of quality in cover and (3) the vicissitudes of farming.

Maintenance probably is the answer to these points. Maintenance was observed on state tracts and shooting preserves where cost has little significance. Can we expect the average farmer to maintain wildlife practices? The answer may be yes when we provide him with an incentive. However, present programs are largely ignoring this question of incentive which was so forcibly described by Miller and Powell (1942).

Incentive programs for farm game were almost entirely lacking. The Pennsylvania program exploits the farmers' fear of hunter damage as an incentive to keep private lands open to hunting. In New Jersey several areas are receiving attention by sportsmen's clubs under state guidance with the same incentive as the prime moving factor. Many of the programs, using coniferous plantings, satisfy the farmers' urge for trees by providing them. None of these appeared too effective in actually improving habitat. It is granted no department could envision providing cash to individual farmers. Perhaps, however, it is time to point out to the hunter that he must offer more direct returns to the farmer. This situation already exists in many well-known waterfowl hunting areas.

Real costs.—The question of cost is largely unanswered. The cost of plants per thousand as distributed is fairly well known. The cost of finishing the job by planting and maintenance is unknown. Finally, the cost for each piece of game produced when the end result of survival of the planting and of its use by wildlife is estimated is entirely unknown. Dambach (1952) has indicated costs in Ohio are "somewhat comparable to the fantastic costs sometimes calculated for game-farm raised birds." This may be true in other states.

In many programs a lack of appreciation of these problems is obvious. Even where understanding is evident, the field men have no time to devote to maintenance or research. Where stress is placed on distributing large numbers of plants or where biologists also handle public relations, amassing data for setting seasons, distributing game-farm birds, and similar duties, the field man is busy indeed. He does not have time to check these points. Frank discussion with many technicians indicated a basic uneasiness on this score but a feeling of helplessness in the face of administrative pressures. It is apparent

that much planning was from the central office down rather than *vice versa*.

The reporting of large numbers of plants distributed should not be the sole criterion for judging a program. As shown in the discussion of specific practices many other factors are important. Certainly results reported should be based only on successfully established plantings. A listing of the areas where the plants go and an indication of their probable usefulness in alleviating present habitat deficiencies are also desirable. Such reports would, of course, be based on valid samples of the plantings. In short, ecological quality not numerical superiority should be stressed.

It is recognized that a major problem in transferring results of research into management is the development of modes of operation on a large scale. This problem is extremely difficult with farm game because of the many variables—both wildlife and human—involved. However, ignoring these variables for the sake of immediate efficiency also presents basic difficulties.

SUGGESTIONS

This report indicates the need for more careful checks on and analysis of present programs. It appears that, with six years of large programs behind us, the situation calls for comprehensive, detailed, and constructive field analyses along two lines.

Administrative checks.—Three types of surveys to obtain information on present programs are desirable:

1. Systematic annual study of the survival of plantings, of the value of their location by present methods, and of the quality of sites being used by present planning procedures.
2. Detailed checks of older plantings or practices to survey wildlife use during periods when they are thought to be significant, to ascertain longevity of the plantings and to discover the conditions conducive to continued wildlife use of these plantings.
3. Cost analyses of the programs with an evaluation of the real costs in the light of the findings on annual survivals and long-term values as indicated above.

It is believed that these surveys will indicate that, in certain regions, practices need to be modified or dropped and in others new techniques developed. In other areas they may be intensified and expanded with a more certain knowledge that they will contribute to wildlife.

To facilitate the development of these surveys, the best points in use by the states may be cited.

1. North Carolina's 10 per cent annual check based on the use of

county maps which show each farm where plants have been distributed.

2. Kentucky's standards of evaluation, using not only survival but planting patterns as criteria.
3. Delaware's detailed records of planting dates, procedures, and techniques used on each farm.
4. Indiana's permanent records of special areas showing location of plantings and other data.
5. Pennsylvania's cost accounting records of each practice.

Two other techniques, as yet largely untried, seem worthy of consideration. First, analysis, by all classes, of the production of food or cover by plants during the assumed critical period for these functions. Such a system has been used for food production of shrub lespedeza by Walter Rosene of the U. S. Fish and Wildlife Service. Second, a scale of criteria indicating whether or not the practice adds significantly to the area on an ecological basis. For instance, where winter cover is an objective, the amount of winter cover already existing in the vicinity should be analyzed.

Research.—To explore fully the future possibilities of habitat improvement programs, more fundamental studies are needed. Some of these are:

1. Wildlife numbers as affected by weather, population structure, disease and possibly other factors on improved areas.
2. Forces exerted by plant succession against desirable habitat.
3. Ways and means of influencing plant succession by extensive practices rather than by "spot" practices.
4. Techniques for modifying agricultural practices in fields to favor wildlife.
5. Minimum and maximum size as well as pattern of plantings or cuttings most desirable in each agricultural region.

To facilitate a critical approach to these problems the best points of several current state programs may be cited here:

1. Florida's studies of quail population dynamics on improved areas.
2. The experiment station projects begun by Georgia, South Carolina and Kentucky.
3. The use of university personnel for project analyses in New York.

CONCLUSIONS

As a result of these studies, the author has attempted to outline a few basic points of a sound, long-time program of habitat improvement. Some points in this connection are:

1. A program should be based on studies of the ecology of *different agricultural areas* in the state and should attempt to fit practices not only to the agricultural pressures but also to the wildlife ecology of each area.
2. Following this, extensive approach of encouraging use of plants of value, both in agriculture and wildlife, may be thrown into high gear and combined with the intensive approach on special areas where wildlife values are of paramount importance to the landowner.
3. Workers assigned to the different agricultural areas should examine the results of their projects continually in view of changing them to meet demonstrated needs. *Results reported should be on actual areas in which practices have been carried out and which have survived for at least one year.*
4. Research applied to actual practices and broadened to study fundamental problems on the relation of these practices to wildlife should be organized at the state level and coordinated on a regional level.

SUMMARY

The results of extensive observations and discussions between October 1951 and July 1952, concerning farm-game habitat restoration projects in 15 states are presented. Four general types of operational procedures are indicated with notes on problems concerning specific practices such as shrub and tree planting, seeding, controlling plant succession and special areas. In the case of specific practices, questions of initial survival, ecological significance, longevity, and maintenance are stressed. The lack of specific information on these points and on the values of the practices to wildlife is pointed out. Finally, suggestions on types of approach to answers on these problems are made and in a broad way the fundamentals of a more realistic program indicated.

LITERATURE CITED

- Bifle, E. B.
1951. Wildlife cover restoration project in Missouri. P. R. Program, Mo. Conservation Comm. 14 pp., processed.
- Caulk, Elizabeth T.
1951. Crop production studies in field borders. 11th Northeast Game Conf., Jackson Mills, W. Va., processed.
- Dambach, C. A.
1951. Habitat improvement should be evaluated. 13th Midwest Wildlife Conf., Minneapolis, Minn., processed.
- Davison, Verne
1949. Bobwhites on the rise. Charles Scribners Sons, 150 pp.
- Edminster, F. C., and R. M. May
1951. Shrub plantings for soil conservation and wildlife cover in the Northeast. U. S. D. A. Circ. 887:1-68.
- Greenwell, Guy A.
1952. Farm ponds, their utilization by wildlife. P. R. Program, Mo. Conservation Comm. 23 pp., processed.
- Johnson, Herbert E.
1951. Multiflora rose hips as pheasant food. Jour. Wildlife Mgt. 15(2):221-222.

- Korschgen, L. J.
 1952. Food habits of the bobwhite quail in Missouri. P. R. program, Mo. Conservation Comm., 56 pp., processed.
- Leopold, A.
 1933. Game management. Charles Scribners Sons, 481 pp.
- Little, H. A.
 1951. An evaluation of Virginia's farm game program. M. S. thesis, Virginia Polytechnic Institute, Blacksburg, Va., 98 pp.
- Miller, J. R., and B. P. Powell
 1942. Game and wild fur production and utilization on agricultural land. U. S. Dept. Agric. Circ. 636:1-58.
- Rosene, W. Jr.
 1950. Spreading tendencies of multiflora rose in the Southeast. Jour. Wildlife Mgt. 14(3):315-319.
 1952. Care and maintenance of bicolor lespedeza. Soil Conservation, XVII (7):151-153.
- Wandell, Willet N.
 1948. Agricultural and wildlife values of habitat improvement plantings on the Illinois black prairie. Trans. 13th N. A. Wildlife Conf., pp. 256-269.
- Warvel, Harold E.
 1951. The southeastern farm game habitat improvement program. Proc. S. E. Assoc. Game and Fish Commissioners, 1951, 8 pp.